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DEFINING THE FUTURE

The MUDEM Simulation Model Design and Application

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MUDEM…

- Is Manpower and Unit Deployment Execution Model
- Is a discrete-event system simulation of units serving routine and contingency demands
- Deals with scripted (deterministic) demands
- Makes dynamic unit deployment decisions
- Was developed for USMC, PA&E to support POM-06
- Was developed and is maintained by Northrop Grumman IT, McLean, VA

System modeled

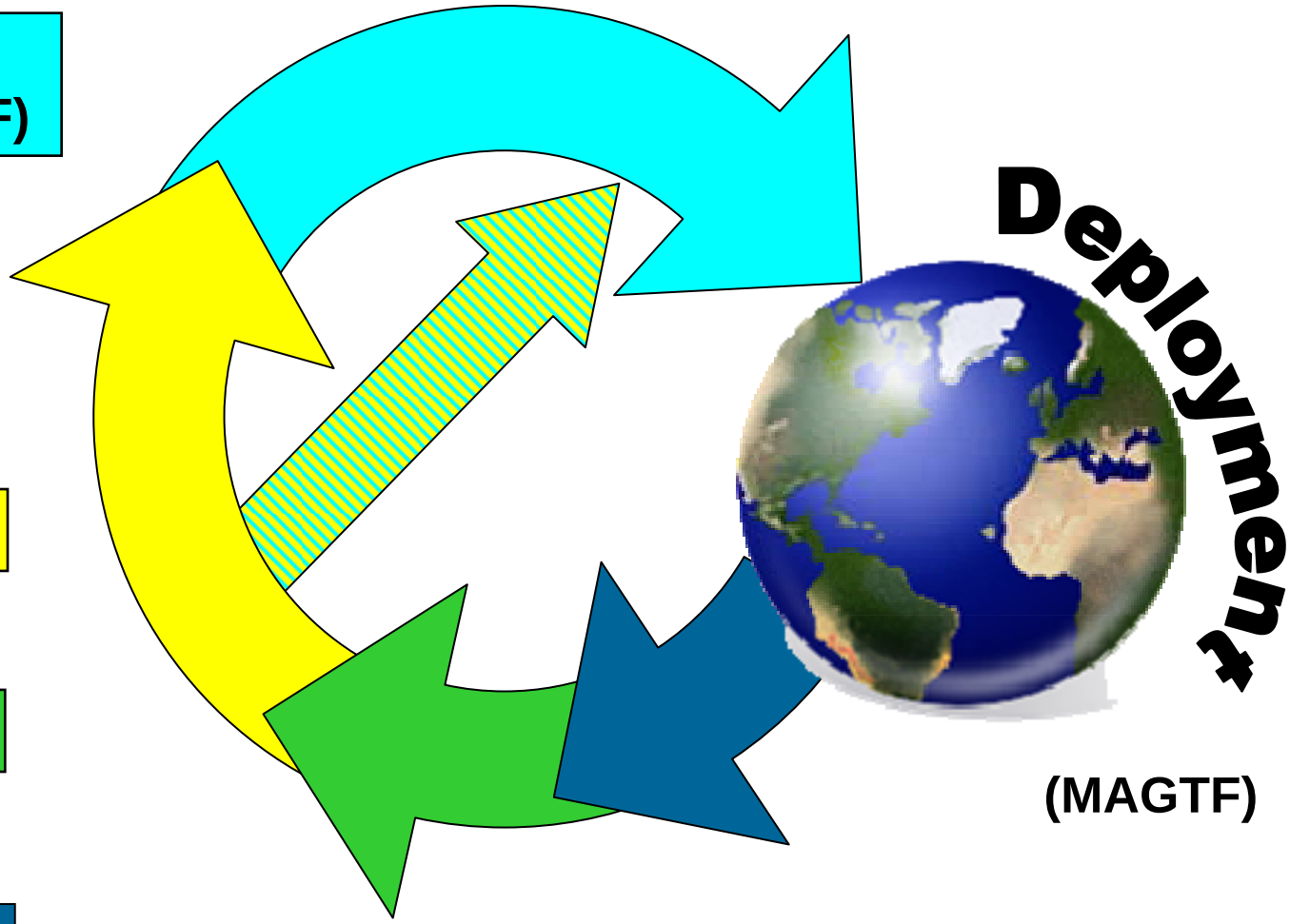
Pre-deployment training (MAGTF)

Reserve activation

Unit training

Stand down

Tether



System modeled

- **USMC units & personnel rotate through several states**
- **A number of routine deployments requirements**
  - UDP to PACOM
  - MEUs to PACOM and EUCOM
  - Aircraft squadrons
- **One-time contingency demands**
- **Choose units to task organize and deploy based on a number of readiness factors and coordination with other units status**
- **Reserve units activation and deployment**
- **Real system uses doctrine and human judgment**

Design principles

- **MOE's**
  - Key MOE was unit deployment tempo (by unit type)
  - PERSTEMPO (by MOS) an increasing priority
- **Typical runs**
  - Add, subtract, or change units
  - Tweak parameters of deployments
  - New contingency
- **Data driven**
  - Keep user in familiar environment: Excel
  - Generalize logic in model
- **Modular**
  - Maintenance and extensibility

Model entities

- **Units**
  - Identified by UIC
  - UTC, “pool”, parent UIC
- **Task Forces**
  - Collection of units
  - Associated with a particular demand
- **Pools – habitual relationships (not doctrine)**

- **Other important items**
  - Demand signal
  - Task force designs
  - Unit orders

Model processes

- **At home processes: training, tether, stand down**
  - Interruptible delay and data collection
- **Deployment: delay and data collection**
- **Initialization of units and task forces**
- **Demand signal and unit selection**
- **Task force batching and unbatching**
- **Reserve activation**

Resolution

- **UTC DEPTEMPO +/- 2 month**
  - Individual unit DEPTEMPO skewed by selection algorithm
  - For USMC, company and det. sized units
- **MOS PERSTEMPO +/- 4 months**
  - MOS's tracked based on UTC staffing and fixed pool size
  - Personnel do not affect readiness calculations
  - Limit 100 critical MOS's
- **Time compression: 5 model years in 15 minutes**
  - Longer runs preferred: sampling bias
  - Intense initialization processing – 20 MY in 30 min

Slide 8

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, 5/21/2007

Data requirements and outputs

Input

- **Unit list**
- **Initial task forces**
- **Demands**
  - Location
  - Duration
  - Priority
- **Task force designs**
  - Unit types
  - Required training time
- **MOS staffing and pool size**
- **Reserve activation criteria**
- **Simulation run time, etc.**

Output

- **Detailed unit status history**
- **Total unit deployment time**
- **Task forces assembled**
- **Demand signals not met**
- **MOS PERSTEMPO**

Future uses and developments

- **Formal V&V ongoing**
- **Analytic tasks**
  - 202,000 end-strength deliberations
  - Dwell time examinations
  - Force sufficiency against demand signal
- **User interface**
  - Ongoing: Data input/manipulation application
  - Ongoing: Rapid reporting application
- **Simulation model refinements**
  - Stochastic demands, deployment time, etc
  - Additional personnel detail (for unit level entities)
  - New model with personnel entities

Questions & back-up slides

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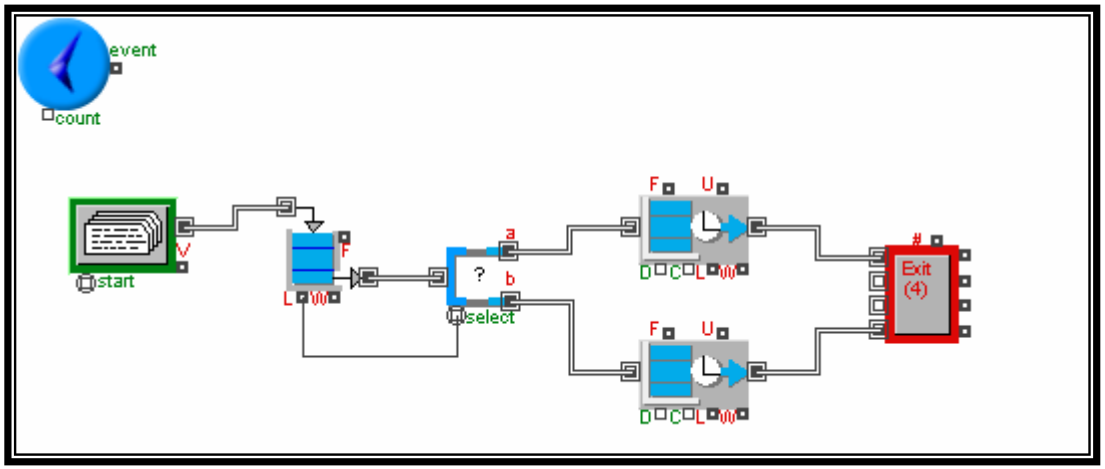
Extend Environment

- Discrete event simulation engine
- Libraries of blocks (sub-processes)
- Blocks connected in GUI to define logic
- Ability to develop blocks and modify existing
- Fast internal database
- Compare to Arena
- Demo: www.imaginethatinc.com



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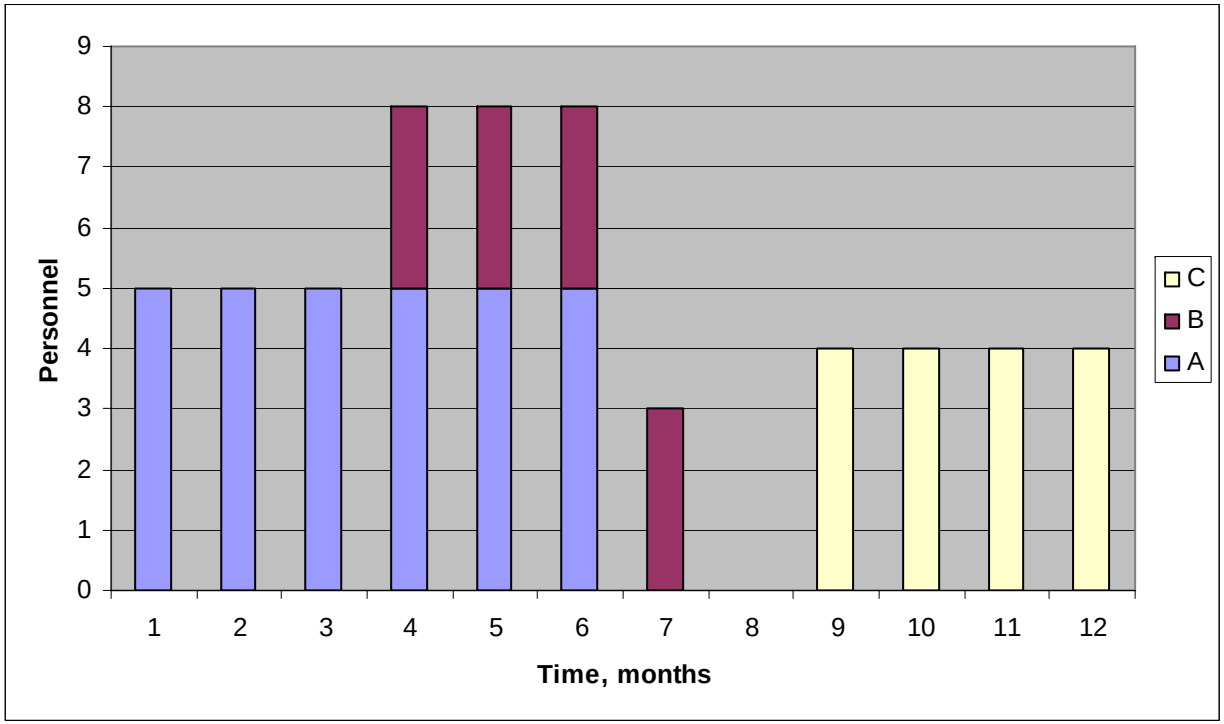
PERSTEMPO MOE calculation

- **Person-days of required deployment divided by possible person-days of deployment (by MOS)**



Suppose there are 15 people in this MOS

Unit A: 5 Pers @ 6 months
Unit B: 3 Pers @ 4 months
Unit C: 4 Pers @ 4 months

58 pers-month/180 pers-month = 0.322

MUDEM data intensity

- 25+ tables
- Relationships require entries to match from a list
- Model requires particular sorting
- Pushed utility of Excel interface to its limits
- Model developer and data developer nearly equally tasked